

**REMARKS**

Claims 1-19 are pending in the application. Claims 1-13 and 17-19 are withdrawn from consideration. Claims 14-16 are rejected.

***Claim Rejections - 35 U.S.C. § 102(b)***

Claims 14-16 are rejected as being anticipated by Baliga (6,075,259) or Sato (6,049,098). This rejection is traversed for at least the following reasons.

The Examiner states that the two references teach SiC having a region with an impurity concentration gradient between  $10 \times 10^{22}/\text{cm}^4$  and  $10 \times 10^{24}/\text{cm}^4$  in a thickness direction on the basis of the content of the face figure and the abstract. The Examiner finds that the impurity concentration in Baliga ( $5 \times 10^{13}/\text{cm}^3$ ) and Sato ( $5 \times 10^{15}/\text{cm}^3 - 1 \times 10^{16}/\text{cm}^3$ ) “**is similar to**” the disclosed impurity concentration, and that the claimed impurity concentration gradient in thickness direction is **inherently the same** in both references when thickness is constant. As subsequently explained, the Examiner misapplies the law of anticipation and inherency in taking this extreme position. The Examiner states that neither the preamble limitations nor the process steps have been considered in assessing the patentability of the claims. Applicant respectfully submits that the Examiner’s position in ignoring clear limitations of the claims is in error.

Turning first to the Examiner’s position on anticipation, the test is that a prior art teaching is “**identical to**” not “**similar to**” a claimed invention. A single prior art reference anticipates a patent claim if it expressly or inherently describes each and every limitation set forth in the patent claim. *Verdegaal Bros., Inc. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). For a teaching that is missing to be “inherent,” the claimed limitation must

necessarily be found from the teachings of the prior art reference. In other words, inherent anticipation requires that the missing descriptive material is "necessarily present," not merely probably or possibly present, in the prior art. *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citing *Continental Can Co. USA, Inc. v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991)).

Clearly, the Examiner's own comparison in her remarks demonstrates that values mentioned in the two prior art references are completely different in unit or dimension from those mentioned in the present invention, as subsequently demonstrated.

#### **Baliga**

As regards Baliga, there is a description with respect to "a first conductivity type charge density of between  $1 \times 10^{12} \text{ cm}^{-2}$  and  $5 \times 10^{13} \text{ cm}^{-2}$ ". The Examiner is respectfully requested to acknowledge that the parameter **charge density** is completely different in physical quantity from **impurity concentration** and **impurity concentration gradient**. Specifically, the charge density is represented by coulomb/m<sup>2</sup> (Q/m<sup>2</sup>) in International Standard of units (abbreviated to SI) and simply often is represented by cm<sup>-2</sup>, by removing coulomb, as mentioned in Baliga. Thus, the charge density disclosed in Baliga stands for the number of electrons per unit area (cm<sup>2</sup>) that falls within a range between  $1 \times 10^{12}$  and  $5 \times 10^{13}$ . Thus, the unit or dimension of the charge density is specified by cm<sup>-2</sup>. Moreover, there is no consideration at all in Baliga about varying the concentration or about an impurity concentration gradient.

On the other hand, the impurity concentration gradient according to the present invention stands for a gradient of impurity concentrations. More specifically, the present invention is

based on a premise that impurity concentration is not constant but varied in a thickness direction and that such a variable impurity concentration has an impurity concentration gradient specified by a difference of the impurity concentration. In this regard, it is to be noted that the impurity concentration is representative of the number of impurities per unit cube (for example,  $\text{cm}^{-3}$ ). Also, the impurity concentration gradient is represented by differentiating a function of the impurity concentration or by dividing a difference of the impurity concentration by a distance. This shows that the impurity concentration gradient is specified by the unit or dimension ( $\text{cm}^{-4}$ ), as explicitly described in Claim 14 of the present invention.

Under the circumstances, Applicant respectfully submit that Baliga has nothing to do with the subject matter of the present invention.

**Sato**

As regards Sato, the Examiner says that Sato (see at col. 6, lines 35-40 for  $5 \times 10^{15}/\text{cm}^3$  -  $1 \times 10^{16}/\text{cm}^3$ ) is similar to disclosed impurity concentration and the claimed impurity concentration gradient in thickness direction is inherently same in both Baliga and Sato, when thickness is constant. Applicant respectfully submits that the description in question is related to an N silicon epitaxial layer 3 but is **not** related to silicon carbide according to the present invention. Applicant respectfully submits that the impurity concentration in the N silicon epitaxial layer 3 is not comparable with the impurity in silicon carbide (the present invention). In addition, Applicant respectfully submits that the uniform phosphorus concentration in the illustrated layer 3 has no impurity concentration gradient because there is no difference of the impurity concentration.

According to the description in Sato, the N silicon epitaxial layer 3 has a uniform phosphorus concentration of  $5 \times 10^{15} \text{ cm}^{-3}$  and  $1 \times 10^{16} \text{ cm}^{-3}$  and has a thickness of  $0.7 \mu\text{m}$  and  $1.0 \mu\text{m}$ . The Examiner cannot assert that an impurity concentration gradient is given by dividing the uniform phosphorus concentration ( $5 \times 10^{15} \text{ cm}^{-3}$  and  $1 \times 10^{16} \text{ cm}^{-3}$ ) by the thickness ( $0.7 \mu\text{m}$  and  $1.0 \mu\text{m}$ ), with this result falling within a range between  $7 \times 10^{19}$  and  $1.4 \times 10^{20} \text{ cm}^{-4}$ . Indeed, the calculated range between  $7 \times 10^{19}$  and  $1.4 \times 10^{20} \text{ cm}^{-4}$  is completely different from the range ( $1 \times 10^{11} / \text{cm}^4$  to  $4 \times 10^{24} / \text{cm}^4$ ) of the impurity concentration gradient of the present invention. Moreover, the teaching of Sato is directed to uniform concentration and therefore the above-calculated range does not make sense.

Under the circumstances, Applicant respectfully submits that claims 14 to 16 are neither anticipated by nor obvious from Baliga and Sato and are therefore patentable over them.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. §  
U.S. APPLN. NO. 10/924,872

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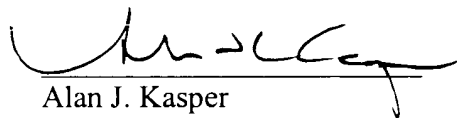
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Date: August 1, 2003